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Dynamic Syntax and dialogue modelling: preliminaries for a  
dialogue-driven account of syntactic change

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## Abstract

This paper sets out an account of grammaticalization in the framework of Dynamic Syntax (DS) in which the emergence of object clitics in Medieval Spanish and the change in their syntactic positioning in Renaissance Spanish are shown to be driven by production constraints on dialogue. First an account of Latin is introduced, incorporating the DS concept of structural underspecification and update, with short and long-distance scrambling analyzed as two variants of a single process. Then an account of generation for Latin is sketched, with tight coordination of parsing and production. It is then argued that the placement of unstressed pronouns in Latin, the encoding of this strategy as a lexical specification of medieval Spanish clitics, and the re-categorization of Renaissance Spanish clitics so that both specification of the clitic and of the verb are called up together as a single lexical macro, are all seen as varying reflexes of the ever-present relevance constraint of minimizing production costs. The result is a formal model of grammaticalization expressing familiar functionalist insights.

## 1 Introduction

The functionalist/formal split in historical linguistics is commonly taken to be irreconcilable, particularly in the area of syntactic change. This paper puts forward an argument that the two are nonetheless reconcilable, if we adopt a psycho-linguistic perspective afforded by recent work on conversational dialogue, put together with a grammar formalism which defines natural-language syntax in terms of the dynamics of parsing. We are going to take one very well-known phenomenon of syntactic change, the emergence of the clitic pronouns in medieval Spanish from the earlier Latin system, and suggest the basis for an account that is simultaneously functional and formal.<sup>1</sup> The account is functionalist in that it starts from a pragmatic explanation of the universally observed strategy of placing given information before new in terms of dialogue pressures on production, and then analyses the mixed Medieval Spanish system as an encoding of these pressures, from which finite preverbal position of most modern Romance clitics can be seen as different

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<sup>1</sup>The detailed work on medieval Spanish, and the diachronic study of Spanish clitics could not have taken the form it has without the input of Miriam Bouzouita. See Bouzouita 2002, Bouzouita and Kempson forthcoming, Bouzouita (this volume) and Bouzouita in preparation. We are very grateful to her for presenting the impetus for this provision of a larger perspective into which her more detailed results might fit and for detailed comments on the analysis. The work of this paper is an application of the Dynamic Syntax framework as applied to dialogue, to which a number of people have contributed over the years: so thanks are due also to Eleni Gregoromichelaki, Wilfried Meyer-Viol, Masayuki Otsuka, and Matthew Purver, among others. Responsibility for all errors, however, remains ours alone.

emergent calcifications of this strategy. The observations aren't new (Givon 1979, Panhuis 1982, Ramat 1990), but the grammar that underpins them is, as indeed is the emphasis on psycholinguistic, more specifically dialogue effects, and the relevance theory account that the analysis feeds into. The grammar system itself is functionally motivated in being defined in terms of parsing, progressively building representations of content. Yet it is respectably formal, defining language change in terms of transitions from an interacting set of general and lexical actions at one point to a different set at a subsequent point. In what follows, we are deliberately programmatic, intending to give just enough sense of the details to see the new direction we think this provides for diachronic syntax, and the theoretical significance of the interaction between grammar and pragmatics that this entails. To give a sense of the direction we are going to go in, this is the way the story runs.

The starting point of the account is the work of Pickering & Garrod on dialogue (Pickering & Garrod 2004).<sup>2</sup> As they point out, speakers and hearers systematically re-use the tools the other person in the dialogue has used wherever possible, a phenomenon they call alignment. Dialogue is replete with ellipsis (where the content of what has just been said is relied on as a means of 'completing' the uttered fragment); with pronouns (where the content is, likewise, picked up from the context); but, additionally, with re-used words with the same interpretation, subcategorization choices and containing syntactic structure:<sup>3</sup>

A: What should Michael give Ruth?

(1) B: For Christmas? A pianola.

C: Unless he's giving her a harpsichord.

As (1) shows, the speaker-hearer coordination is so intertwined that interlocutors may even finish each other's sentences. It is the particular dynamics underpinning this pervasive context-dependence which we argue is the driving force behind the emergent syntactic properties of clitics in the shift from Latin to Romance.

The grammar framework to be used, Dynamic Syntax (DS: Kempson et al. (2001), Cann et al. (2005)), is defined as inducing semantic representations from strings of words uttered in context; and these representations are linked together through appropriate construal of anaphoric devices of one sort or another. In consequence, the minimal

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<sup>2</sup>Pickering & Garrod set out a challenge to those involved in formal and psycho-linguistic modelling that all such models should be evaluated by how well the formalism defined reflects the data of conversational dialogue, the core language data.

<sup>3</sup>Note the repetition of the double-object construction in C's utterance, rather than a shift into a NP-PP form.

construction unit in this system is that of predicate-argument structures – individual propositional domains, not the artificial units determined by the writing convention of the space between a capital letter and a full stop, nor indeed that of clausal sequences of words. In conjunction with such a commitment to growth of semantic representations, we assume that speakers and hearers necessarily keep processing costs to the minimum, a consequence of the tenets of relevance theory. These two assumptions taken together entail that whenever an individual grammar system licenses freedom of order within the process of constructing any propositional unit, anaphoric expressions will be positioned in such a way that their construal ensures minimization of the context relative to which they have to be interpreted – put simply, as close to the left edge of a sequence building up such a unit as possible.

This enables us to address the supposed distinction between strong and weak pronouns in Latin (the latter the precursor to the subsequent clitic pronouns in Romance). Some pronouns, the ones that are stressed, occur at the very edge of an emergent propositional domain, indeed in part indicating what is such an edge, occurring in the position where they can be focussed. The remainder, by definition, being not stressed, occur in second position in some roughly clausal sequence, following immediately after focussed constituents, relative pronouns, complementizers, negation, even verbs when there's nothing else (the Wackernagel and Tobler-Mussafia effects). What each of these triggers shares, given a real-time parsing perspective, is the property of allowing the parser to uniquely identify the first edge of such a structure. So the placement strategy for weak pronouns is to place them as close as possible to the left edge of emergent predicate-argument structures once that new emergent domain has been definitively identified by some OTHER expression.<sup>4</sup> So the strong and weak use of pronouns are two sides of the same coin, the pronoun either serving solely an anaphoric role and relying on something else to provide a boundary-edge, or simultaneously serving an anaphoric role plus that of a boundary-indicator, in both cases being placed so as to minimize search in the context for their antecedent value.

Since this minimizing of context relative to each domain is a pragmatic strategy subject to very general cognitive considerations, we might expect that this two-faceted role of an anaphoric expression could remain stable over a long period of time (see Sornicola

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<sup>4</sup>As we shall see, in applying equally naturally to complementizers, relative pronouns, negation, and so-called focussed constituents, this analysis has the edge over accounts in terms of attraction to focus, which, as Adams points out (1994), fails to apply to what is arguably the central case of clitic attraction, the relative pronoun (over and above the puzzle of why such contrary-to-focus elements should be attracted to a focus site), and indeed over phonological explanations also, though intonation is often used to buttress the identification of such structures.

1996 on the role of stability in language change). And indeed it was retained over a long spell of Latin in the distribution of its pronouns, it is displayed during the extensive period in which Medieval Spanish was used, and it is still preserved in Galician (a dialect of Portuguese). As is wellknown, the pattern is very widespread. Nevertheless, as the bifurcation between unstressed and strong forms of pronouns increases, these may become associated with distinct and complementary parsing strategies, with the procedures for tree growth associated with early and noncontrastive construal of pronouns becoming encoded via routinisation of actions for the distinct modes of construal. The first form such a lexical encoding would take to determine these actions will have to take the form of a list of all the various structural environments that trigger them; but, again as a consequence of that encoding, such a clumsy disjunction will in due course of term simplify due to internal pressures of the system. This is a calcification of what had been a general process (driven solely by production constraints) and became an encoded sequence of actions specific to the clitics.

We argue that this encoding results from the routinization of alignment patterns often found in dialogue (Pickering & Garrod 2004, Garrod & Docherty 1994) where speaker and hearer re-use words and constructions that have already been used in the discourse, a strategy of re-using actions which enables them to avoid what would otherwise be highly costly incremental word-by-word search in the full lexicon for appropriate actions. If such a sequence of actions gets stored as a ‘routinized’ unit, it can be retrieved as a whole relative to the trigger for parsing the first word in the stored sequence, in so doing economizing dramatically on decision-making in the production process. This is a clear means of reducing production costs, hence maximizing relevance. The re-bracketing characteristic of the shift from medieval Spanish, in which pronouns that had been enclitic on some early element came to be pro-clitic on a verb, can then be modelled in the same terms. As Adams and others point out (Adams 1994, Ramat 1990, Salvi 1996), sequences of actions associated with inducing individual predicate argument arrays in many cases leave the weak pronouns immediately preceding the verb, and we accordingly expect routinization in response to such commonly used actions to take the form of a sequence of actions covering both pronoun and verb, operating in the environment which triggers the action of the pronoun. These successive steps of routinization constitute a formal reconstruction of grammaticalization: the process is modelled as the shift from some generally available tree-growth process into one that is induced by one particular form of a word. This is then stored as a lexically driven sequence of actions which itself in due course may become

part of a larger lexical unit. This account, as an observation of what took place, is not new at all: what is new in this account is the direct correspondence between the formal account and traditional insights. In particular, within the framework to be introduced, ALL projection of structure is projection of semantic structure, whether by generally available syntactic rules, lexical rules, or specifications provided by morphological encodings; so there are ONLY issues of economy which dictate whether some sequence of tree-update actions is given by general syntactic rule or lexicon-internally. So overall, the claim to be presented is that both the point of departure for the change to a clitic-based system, the nature of the change, and the reason why it might lead to a re-bracketing, can all be seen as the effect of production pressures in dialogue constrained by relevance as driven by a parsing-based system of production. And this, we suggest, is an extremely natural basis for syntactic change – for we all do dialogue all the time. Its cross-society influence is immediate, and ever present.

## 2 Towards a Dynamic Syntax of Latin

The Dynamic Syntax model (DS) which we use as the framework for this analysis is radical in that it is a grammar formalism that reflects the step-wise way in which interpretation is built up during a parse sequence. A mapping is defined from words, as parsing actions, onto progressively enriched representations of content, until a fixed (in part, contextually established) interpretation is constructed. Interpretation in this framework is articulated as a semantically transparent tree structure, in which a logical formula decorates the top node, and the various sub-terms of that formula decorate the nodes it dominates. Individual nodes are decorated with *Formula* (*Fo*) and *Type* (*Ty*) values, reflecting semantic content in terms of expressions of some typed lambda calculus. The process of tree-growth is the basis of syntactic explanation: a sentence is defined to be well-formed just in case there is at least one possible route through that process. Central to the process is the concept of requirement  $?X$  for any decoration  $X$ . For example, decorations on nodes such as  $?Ty(t)$ ,  $?Ty(e)$ ,  $?Ty(e \rightarrow t)$  etc. express requirements to construct formulae of the appropriate type on the nodes so decorated (propositions, terms and predicates respectively), and these drive the subsequent tree-construction process.<sup>5</sup>

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<sup>5</sup>The formal system underpinning the partial trees that are constructed is a logic of finite trees (LOFT: Blackburn & Meyer-Viol 1994). There are two basic modalities,  $\langle \downarrow \rangle$  and  $\langle \uparrow \rangle$ , such that  $\langle \downarrow \rangle \alpha$  holds at a node if  $\alpha$  holds at its daughter, and its inverse,  $\langle \uparrow \rangle \alpha$ , holds at a node if  $\alpha$  holds at its mother. Function and argument relations are distinguished by defining two types of daughter relation,  $\langle \downarrow_0 \rangle$  for argument daughters,  $\langle \downarrow_1 \rangle$  for functor daughters (with their inverses  $\langle \uparrow_0 \rangle$ ,  $\langle \uparrow_1 \rangle$ ). There is also an additional ‘LINK’ operator,  $\langle L \rangle$ , which

## 2.1 The Parsing Mechanism

The process of both setting out and building up interpretation for a string is defined as a serial process of tree growth following the order of words in a string. Individual steps take the parser from a tree with just a single root-node decorated with  $?Ty(t)$ , indicating the requirement (the assigned goal) of establishing a formula of type  $t$ , finally deriving a binary branching tree with all nodes decorated with formula values (see the TWO trees in Figure 1). So in the parsing of (2), we have the initial tree and final tree as in Figure 1:

- (2) *Xerxes praemium proposuit*  
 Xerxes=NOM reward=ACC offered  
 “Xerxes offered a reward.”

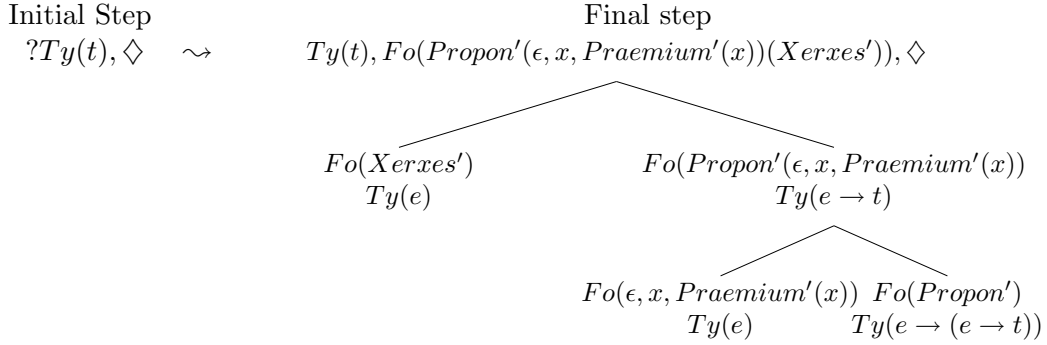


Figure 1: Parsing *Xerxes praemium proposuit*

The pointer,  $\diamond$ , indicates the node under development. So, at the initial step in any transition sequence, the pointer is at the initial (root) node in some emergent tree; and at the final step the pointer returns to that node in completing its decoration (see figure 1).

The intermediate steps in deriving such trees are determined either by general computational actions, such as anticipating a subject-predicate structure, or lexical actions triggered by parsing lexical items in the order in which they are presented in some string of words.<sup>6</sup> All such actions are procedures for making and decorating nodes in a tree, and

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relates paired trees, with a LINK relation from a node in one tree to the top node of another (see below). With these primitive relations, concepts of ‘dominate’ are definable in ways that are standard in formal tree-logic systems (see the concept of ‘functional uncertainty’ defined in LFG: Kaplan and Zaenen 1989). Thus  $(\uparrow_*)Tn(a)$  holds at a node if some node  $Tn(a)$  is along some sequence of mother relations from this node.

<sup>6</sup>Quantification is expressed in terms of variable-binding term operators, so that quantifying NPs like all other NPs are of type  $e$ , with quantifiers analyzed in the manner of arbitrary names posited in predicate-logic proof steps: all scope effects are expressed within the evaluation of the restrictor of the term itself. The logic underpinning this is the epsilon calculus, of which the primary quantifying term is the epsilon term, the



moving around within a local subtree. Lexical specifications are defined as macros of such actions which characteristically do not simply annotate nodes with information about semantic content, but may equally project partial trees. This is particularly relevant to verbs, which induce some, or all, of the propositional template they express. In English, by hypothesis (see Cann et al. 2005: chapter 2), verbs do not project their semantic subject position, but in other languages, such as Latin, they project full propositional structure; and these specifications include not merely a one- or two-place predicate specification, but, if the language is pro-drop, a specification of the accompanying arguments that is equivalent to what in English might be a sequence of subject pronoun, verb and object pronoun.<sup>7</sup>

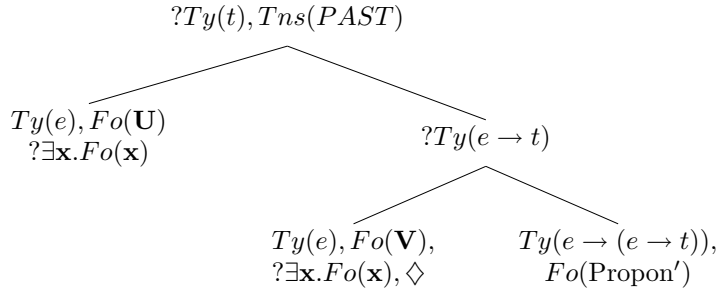


Figure 2: Result of running lexical actions of *proposuit*

#### Defining lexical actions of *proposuit*:

internal structure of such terms containing an epsilon binder,  $\epsilon$ , a variable, and a restrictor: eg  $\epsilon, x, Man'(x)$ . Since in Latin, nouns project full specification of terms, the structure defined to be projected by *praemium* would be a subtree of which the quantifying term is the topnode, dominating a subtree decorated with a binder, a variable, and a restrictor specification. Furthermore, given the sensitivity to context in the way such bare nouns are understood, either as definite or as indefinite, this variation can be straightforwardly expressed simply by not requiring that they be assigned a fresh variable (unlike determiner-noun configurations in other languages: see Kempson et al 2001). We leave all details on one side.

<sup>7</sup>According to this characterization, Latin is object drop, which is not uncontentious. One way to capture canonical verb object orderings within a full pro-drop system is to define the pointer to be at the object node on the tree following the parse of a verb, with the effect that the ordering of the object after the verb would be the least marked of the available options (see Cann et al 2005 for discussion of right-periphery effects). We ignore details of tense specification throughout this paper.

IF	$?Ty(t)$	
THEN	$put(Tns(PAST));$	Tense
	$make(\langle \downarrow_0 \rangle) : go(\langle \downarrow_0 \rangle);$	
	$put(Ty(e), Fo(\mathbf{U}), ?\exists \mathbf{x}. Fo(\mathbf{x})); go(\langle \uparrow_0 \rangle)$	Subject Metavariable
	$make(\langle \downarrow_1 \rangle); go(\langle \downarrow_1 \rangle); put(?Ty(e \rightarrow t));$	Predicate Node
	$make(\langle \downarrow_1 \rangle); go(\langle \downarrow_1 \rangle);$	
	$put(Fo(Propon'), Ty(e \rightarrow e \rightarrow t), [\downarrow] \perp)$	Main Functor
	$go(\langle \uparrow_1 \rangle); make(\langle \downarrow_0 \rangle); go(\langle \downarrow_0 \rangle);$	
	$put(Fo(\mathbf{V}), Ty(e), ?\exists x. Fo(x))$	Internal Argument
ELSE	Abort	

Thus in parsing a transitive verb like *proposuit*, a tree structure is projected that expresses the fact that the predicate associated with *proposuit* takes two semantic arguments, and these are provided with concept-placeholders, meta-variables  $\mathbf{U}$ ,  $\mathbf{V}$ , that stand for some value to be assigned from the context, exactly as though there were morphologically identifiable pronouns in the sequence.<sup>8</sup> What is induced is a partial tree, and this is in virtue of an uninterruptable macro of actions which construct and decorate individual nodes. This gives the first flavour of the DS commitment to articulating the projection of a semantic representation as involving articulation of concepts of underspecification and update, both of content and structure. Both pronouns and verb specifications project partial specifications of content through such metavariables, and these have to be replaced as part of the process of constructing an interpretation. This too is faithfully modelled in the system, since all such partial specifications have an associated requirement which ensures that they are replaced with a contentful value during the construction process. This substitution process is directly reflected in the system with a pragmatic process of substitution which enriches some lexically provided metavariable with a term that has already been established in context. But this has a further significance: the DS definition of well-formedness for a string involves the pairing of a string with a tree at output, with no outstanding requirements on any of its nodes, where that tree is derived from actions associated with the words taken in strict sequence. The effect is that the notion of well-formedness is itself context dependent (see Cann et al 2005 chapter 9).

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<sup>8</sup>The difference between lexicalised pronouns on the one hand, and agreement systems and clitics functioning in an agreement-like manner on the other, can be expressed by the distinction between whether or not the decoration of the node in question has an associated terminal-node restriction in the manner of full lexical items. This is the decoration  $[\downarrow] \perp$  included in the specification of *proposuit*. We ignore these details here: see Cann et al 2005.

## 2.2 The Left Periphery

### 2.2.1 Structural Underspecification and its update

This concept of underspecification plus update is extended well beyond the conventional recognition of anaphora as a content-based form of underspecification: central to Dynamic Syntax is the articulation of a structural form of underspecification plus update. In particular, discontinuity effects are expressed by licensing structural relations that are relatively weak, characterised as a dominance relation that only subsequently gets updated, with the point of update constituting the point at which the initial early partial specification becomes fully determined. For example, long-distance dependency effects are expressed by the construction of a node in some newly initiated logical structure to be developed downwards from a top type- $t$ -requiring node. This node is specified only as dominated by that top node, its position within the unfolding tree being otherwise unfixed at this point in the construal process. Such nodes are annotated as  $\langle \uparrow_* \rangle Tn(0)$ , using the standard formal concept of ‘dominate’ (see footnote 5).<sup>9</sup> It is this move which enables the presentation of content being presented as a tree structure to be built up incrementally, for this unfixed relation needs, at some point in the construction process, to be fully specified in order to satisfy its requirement ( $? \exists x. Tn(x)$ ) that it eventually be assigned a fixed tree node position as in the displayed construal of (3) in figure 3:

- (3) *Praemium proposuit* [Latin]  
 reward offer=3.SG.PAST  
 “He offered a reward.”

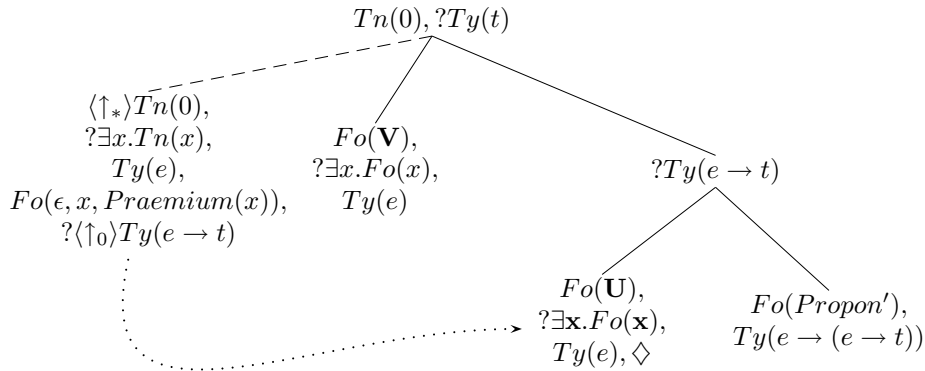


Figure 3: Updating an unfixed node

<sup>9</sup> $Tn$  is a predicate taking tree-node labels as value, e.g.  $Tn(0)$  indicates the rootnode. The provided annotation then indicates that the rootnode dominates the current node.

On this partial tree, the unfixed node (indicated by the dashed line) is decorated with  $\langle \uparrow_* \rangle Tn(0), ?\exists x.Tn(x)$ , indicating the domination relation and the requirement for its update. It is decorated with  $Ty(e), Fo(\epsilon, x, Praemium(x))$  specifying its formula and type values that result from having parsed the word *praemium*; but it is also decorated with  $?(\uparrow_0)Ty(e \rightarrow t)$  which is a case specification that the mother node must in the output be decorated with a formula of predicate type. In this derivation, case merely constrains the update within a structure independently provided by the actions of the verb; and this is updated by unifying that unfixed node with the object argument node provided by *proposuit*. With the subject argument then identified indexically from context, the parse of the string can lead to a fully completed propositional structure with no outstanding requirements, and so is wellformed.

There is a further form of parallelism with anaphora which enables us to distinguish long-distance discontinuity effects and more local discontinuity effects: we distinguish three different forms of structural underspecification in terms of the domain within which their update must be provided. There is (i) a dominate relation which has to be updated within an essentially local minimal propositional structure, associated with nodes which are introduced as ‘locally unfixed’; (ii) a dominate relation that has to be updated within an individual structure but not necessarily locally (the general case already introduced); and (iii), a weakest form of dominate, which allows update even across a sequence of trees. Of these, the computational action introducing a locally unfixed node, involves introducing from some treenode  $Tn(a)$ , an unspecified sequence of functor relations ( $\langle \uparrow_*^1 \rangle$ ), and an argument relation ( $\langle \uparrow_0 \rangle$ ) – in effect, a functor spine along which arguments can be developed, plus one such argument node. The relation between such a node and the dominating node  $Tn(a)$  is thus defined as  $\langle \uparrow_0 \rangle \langle \uparrow_*^1 \rangle Tn(a)$ .

Defining a computational action which introduces locally unfixed nodes enables us to capture local freedom of ordering of individual argument/adjunct constituents with respect to some verb. In languages which license such free permutation of argument expressions, there is essential interaction with a constructive use of case. In these languages, case is defined to license the fixing of its hierarchical position in the emergent tree as soon as the decorations on an unfixed node are completed (see Nordlinger 1998).<sup>10</sup> For

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<sup>10</sup>This function of case serves to license successful derivations despite there being a restriction that there be only one unfixed node of a type at time. This constraint on only one unfixed relation of a type from any one node at a time is a consequence of the tree logic underpinning the system (Blackburn & Meyer-Viol 1994). Formally, nothing prevents the construction of more than one unfixed node, but all nodes in a tree are identified by their relation to other nodes in a tree. This has the consequence that if more than one node is constructed from a dominating node characterized only as dominated by that node, these will collapse to a

example, in the parsing of a string such as (4), the parsing of *praemium* involves building a locally unfixed node and from the accusative case specification fixing it as the matrix object well before the parsing of the verb so that the result of parsing *praemium* in (4) is a partial propositional tree with a predicate-requiring node and just its immediate daughter-argument node:

- (4) *Praemium Xerxes proposuit*  
reward=ACC Xerxes=NOM offered  
“Xerxes offered a reward.”

Once this relation is fixed, another unfixed node can be introduced in order to parse *Xerxes* by the very same process of using the case specification, this time nominative, to fix the tree relation as an argument daughter to the type-*t*-requiring node, yielding a partial tree with so-far just two argument nodes (see figure 4, where the succession of partial trees required for the processing of these two NPs is displayed).<sup>11</sup>

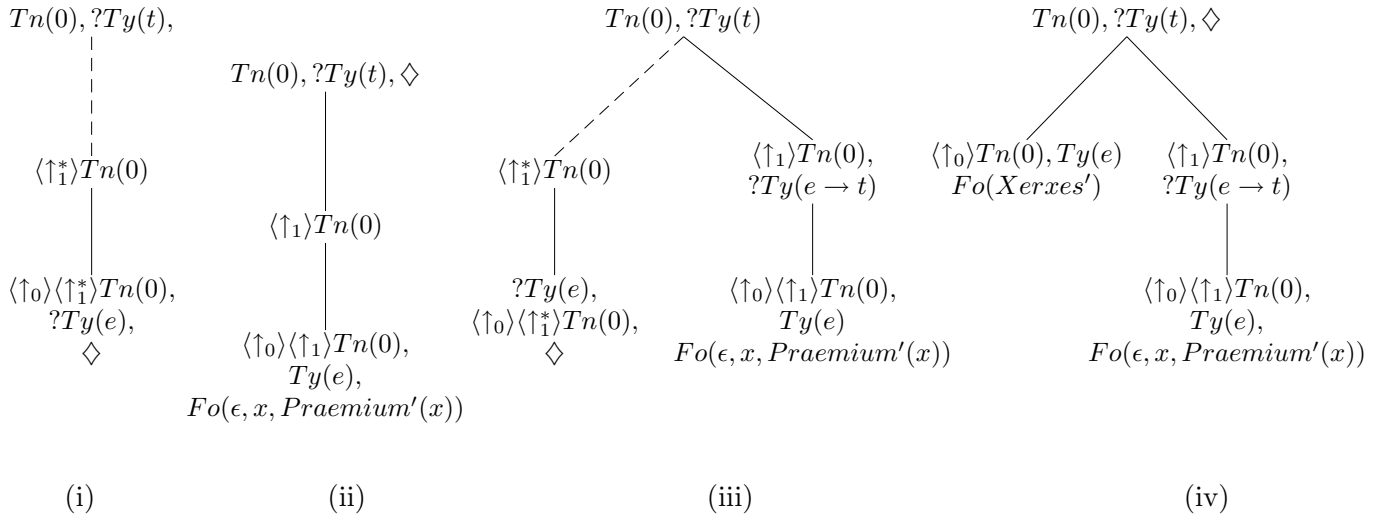


Figure 4: Incremental parsing of *Praemium Xerxes*

The verb then follows, filling out the remainder of the propositional structure to yield the appropriate output tree with  $Fo(Xerxes')$  as subject argument to the predicate  $Fo(Propon')$ ,  $Fo(ε, x, Praemium'(x))$  as its object argument.<sup>12</sup> This allows permutation

single node yielding inconsistent decorations, and the whole tree will be debarred.

<sup>11</sup>The details of this process are not critical to this paper, but see Cann et al. (2005) chapter 6 for a discussion of this process with respect to Japanese, and Bouzouita (this volume) for a detailed specification of clitics that relies on the processes that underpin these actions.

<sup>12</sup>Unlike two case-distinguished unfixed nodes, either subject or object nodes induced by actions of the verb harmlessly collapse with those introduced as unfixed and updated through constructive use of case (Nordlinger 1998), as annotations provided by the verb are compatible with those provided by computational actions used

of constituent order without any fixed interpretational effect.

### 2.2.2 Building paired trees: topic structures as linked trees

This family of parse strategies by no means completes the list of possible DS strategies for general tree-unfolding. In addition, pairs of trees can be built – so-called linked trees – which are subject to a restriction that they are anaphorically linked but otherwise independent; and these may, furthermore, be constructed in tandem, with one partial tree being initiated, then a linked tree being developed from one of its nodes, with the pointer subsequently returning to complete the originally initiated tree only once that linked tree being completed. Relative clauses, for example, are analyzed as involving the construction of pairs of independent propositional trees that share some term through the relative pronoun. The process of inducing such pairs of semantic trees is permitted by defining an additional modal operator in the tree logic,  $\langle L \rangle$ , and its inverse  $\langle L^{-1} \rangle$ ; and a rule is defined to yield a transition from an arbitrary node in one tree across a LINK relation to the top node of a new propositional tree. This tree is introduced with a requirement that one of its nodes must share a term with the node (the ‘head’) from which the transition was constructed. This copy is, in Latin as in English, supplied anaphorically by the relative pronoun (see figure 5):<sup>13</sup>

- (5) *Xerxes, qui nos amabat...*  
 Xerxes=NOM who=NOM us=ACC loved  
 “Xerxes, who loved us,...”

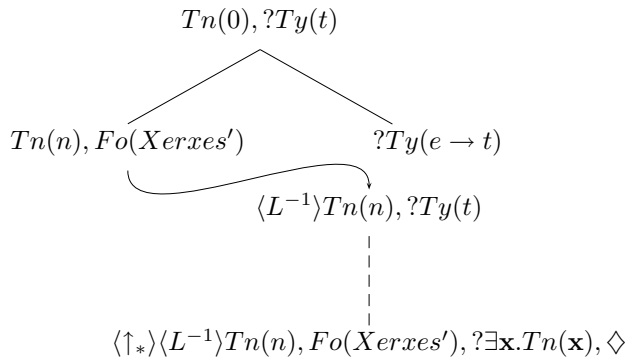


Figure 5: Building an unfixed node for relative clause construal

in parsing the NPs – the formula decorations provided on the verb-induced argument nodes are metavariables, compatible with all formula updates.

<sup>13</sup>In Latin there is no necessary contiguity between the head and the relative pronoun, suggesting that the relative pronoun itself may decorate a locally unfixed node. We ignore this here.

We will not go further into details of the analysis of relative clauses here (see Cann et al. 2005, ch 4). However, the action of introducing paired trees of the sort associated with relative clauses applies more generally than just to a single construction type: it is a general computational action which from any node with a completed formula decoration,  $Fo(\alpha)$ , licenses the construction of a linked tree which is required to contain a copy of that formula  $Fo(\alpha)$ . Given observed parallelisms between relative clauses and topic structures (see Kempson et al 2001), we define topic structures as involving an initially constructed tree of type  $e$ , decorated by some term, with a LINK relation to a propositional tree required to contain somewhere within it a copy of that term:

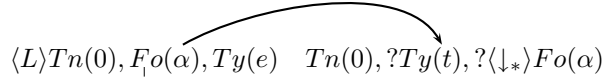


Figure 6: Topic structure construal

One treenode, the rootnode  $Tn(0)$ , has another tree to which it is linked, and that tree,  $\langle L \rangle Tn(0)$ , is decorated with solely a type  $e$  term,  $Fo(\alpha)$  ( $\langle L \rangle$  for ‘linked’). Note the decoration,  $?\langle \downarrow_* \rangle Fo(\alpha)$ : this is a requirement that somewhere in the tree to be developed from this node, there must be a node decorated with  $Fo(\alpha)$ , whatever  $\alpha$  might be. Since this decoration is a requirement, and does not provide the formula itself, there has to be an anaphoric expression somewhere in the following string to provide this second copy of the formula, as otherwise in the resulting structure an outstanding requirement will remain and the string will not be well-formed. This modal form of requirement also drives the processing of relative clauses; but in that case, this requirement was met by the relative pronoun. In topic structures, with no such encoded pronoun, regular anaphoric devices have to be made use of in providing this value.

We now of course have several strategies for any single string-interpretation pair. In particular, there will be three ways of building up interpretation for subjects in all subject pro-drop languages. First, the value of the metavariable at the subject-argument node may be provided by building a linked structure, taking the term projected from the subject expression to decorate the introduced linked-structure node and then using it to provide the context for identifying the value of this metavariable by a process of substitution, as in the first tree of figure 7.<sup>14</sup> Second, the value of the metavariable may

<sup>14</sup>Note the  $\uparrow$  in figure 7 indicating pragmatic substitution.

be provided by taking the subject expression to provide decorations on an unfixed node, with this unfixed node unifying with the subject node provided by the verb, as in the second tree of figure 7. Third, the subject relation may get fixed by constructing a locally unfixed node and updating immediately upon the parsing of the subject expression to yield a fixed subject relation prior to parsing the verb (the final tree of figure 7). And indeed, as is widely observed of both subject pro-drop and full pro-drop languages, the subject expression can serve either a background, contrastive or more neutral purpose.<sup>15</sup>

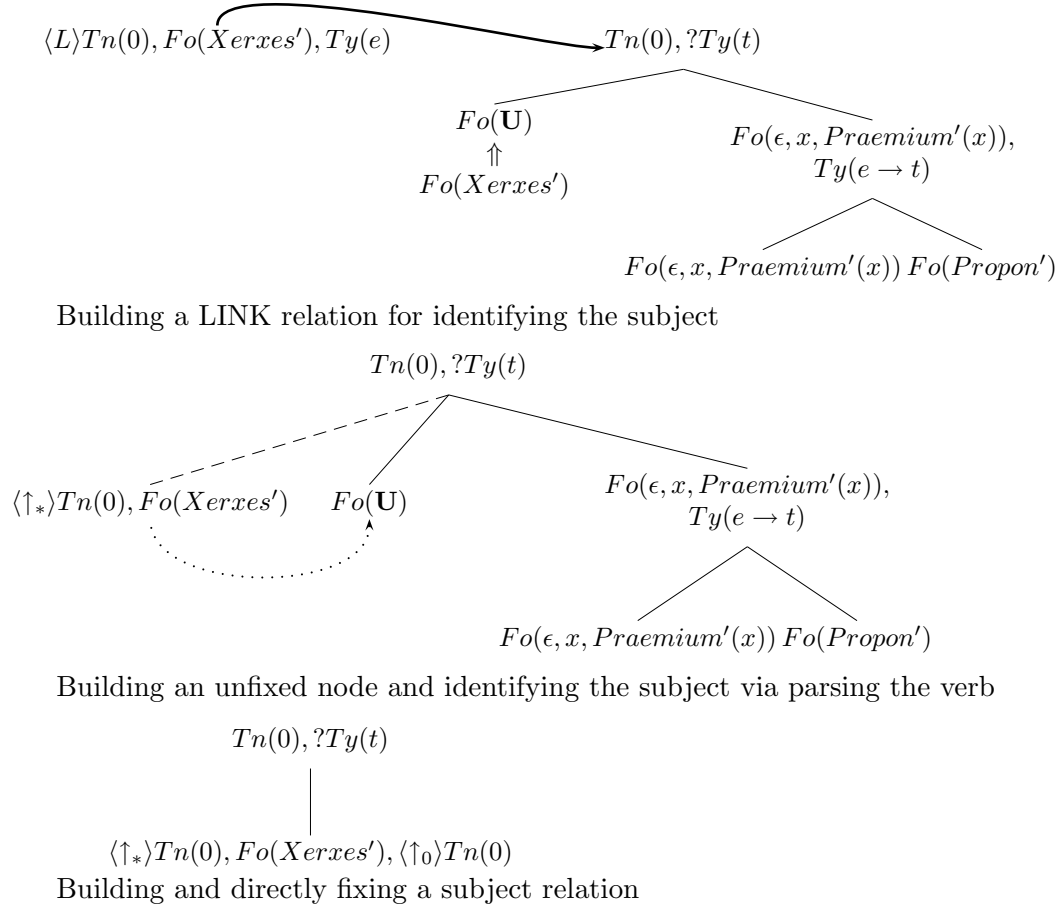


Figure 7: Three ways of identifying a subject relation

So DS provides processes for building up predicate-argument arrays through progressively updating what may initially be very underspecified relations, and these processes may be carried out successively, over a sequence of predicate-argument structures, using anaphoric devices and the sharing of terms wherever possible. The commitment to multiple strategies for even a single denotational content for a string is part and parcel of

<sup>15</sup>See Belletti 1999 for arguments of the clause-external status of preposed subject in Spanish.



developing a parsing-directed grammar formalism, for the system makes available the fine structure of HOW interpretation is built up, not merely defining string-content mappings.

## 2.3 Production

Although it is not commonplace in theoretical syntax to mention matters of production, the parsing perspective of DS invites some discussion of the subject and, as we shall see, this extra dimension provides the basis for an account of dialogue and thus, by hypothesis, of syntactic change.

In production, the minimal assumption is that the very same rules used in parsing apply also, the essential difference being that while the parser may not know in advance the interpretation to be constructed, the producer in contrast must do so, at least in part. So we assume that, in generation, the very same computational actions initiate the development of some tree; but each update step licensed by the parsing mechanism has to meet the severe restriction of being a sequence of progressive enrichments towards yielding a particular tree, the goal tree representing the interpretation to be conveyed.<sup>16</sup> For example, in the production of (4), *Praemium Xerxes proposuit*, the first action in initiating a sequence of steps to yield the goal tree is to start with the step that introduces a node decorated with the requirement  $?Ty(t)$ , just as in parsing; and one possible follow-up to this step is then to introduce a locally unfixed node (see figure 8). Transparently, both the initial tree and this development subsume the goal tree in the sense that there is a licensed progression from these to the richer goal tree.

From this step on, there is the problem of searching in the lexicon for words to express the given conceptual array. With this weak an update in structure, a very large number of lexical expansions are available; indeed in principle the entire lexicon needs to be scanned, though only words that induce subtrees with a formula of type  $e$  will even be putative contenders, given that the pointer,  $\diamond$ , is at a type- $e$ -requiring node. Of these, one word whose lexical actions lead to a partial tree that subsumes the goal tree is the word *praemium*; so this can be selected, and the word *praemium* uttered. One possible use of the case specification is then, at this early stage, to enrich that underspecified tree relation to provide a fixed object relation, and so we can take as established a partial tree with just two relations, that between the top node and some predicate-requiring node,

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<sup>16</sup>Formally a subsumption relation is required to hold between the parse tree and the goal tree. For an early development of this view, see Otsuka & Purver 2002, Purver & Otsuka 2003.

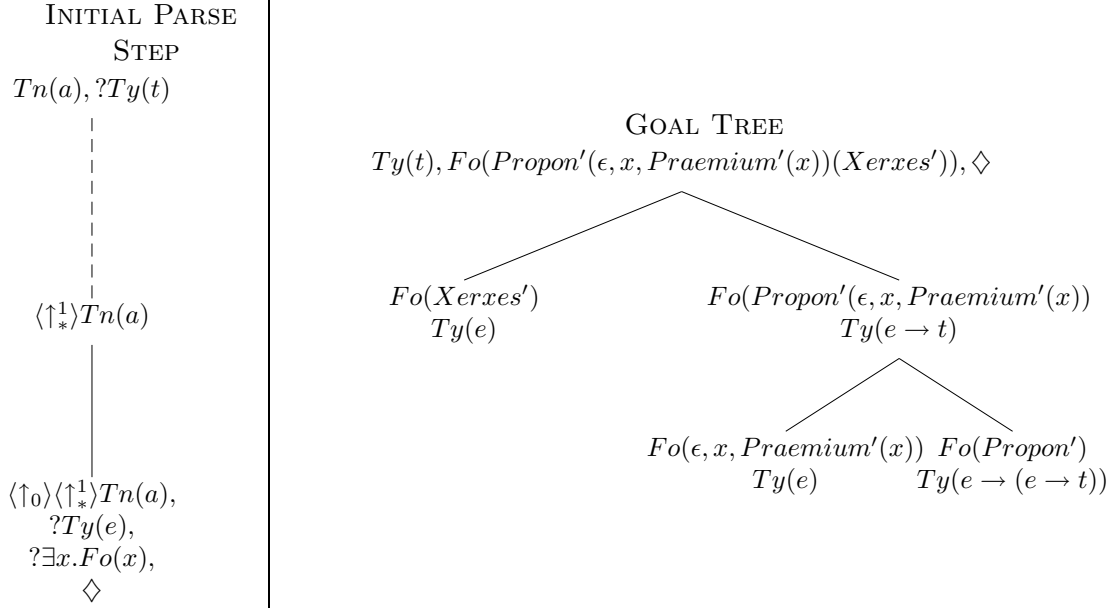


Figure 8: First step in producing *Praemium Xerxes proposuit* with a locally unfixed node

and between that predicate-requiring node and an object node. Such a sequence of parse steps can be re-used to license the introduction of a further unfixed node, so a subject node can be introduced by an analogous routine, and the utterance of the word *Xerxes* also licensed. Of course, this isn't the only possible sequence of actions, and more than one string matches the intended goal tree; but all that matters is that with this choice, the subsumption relation between the parse and goal trees is satisfied, so the choice of word justified. Finally, the search through the lexicon is now for a word which provides the appropriate update to that partial tree so as to provide the predicate. Again, in principle every word in the lexicon needs to be checked out, but with *Praemium Xerxes* as the sequence already selected, only the verb *proposuit* will do, for only its actions will yield the requisite result. The actions associated with the verb also include the building of a subject node and an object node, but this is entirely unproblematic. The apparent re-building of a subject and object node may be carried out without untoward effect, for any action additionally to construct either node will simply collapse with the node already constructed. The effect of retrieving the lexical item *proposuit* is to fill out the remainder of the structure of the goal tree, including the decoration of the functor node with the predicate node *Propon'*. And once these actions are in place, the decoration of all nonterminal nodes can be completed and the goal tree duly reached. So production

and parsing tasks are solved in harmony, using the very same devices.

Despite the simplicity of this parsing/production correlation as so far set out, this production task threatens to be impossible. A mammoth blind search through the total lexicon appears to be imposed, a task which would be bad enough even if such full search only had to be done once per sentence. But the commitment to production proceeding in lock-step with parsing means that this search must be made incrementally, word by word: and the problem is compounded by the multiple possible ways of communicating the goal tree: in free word order languages, where there are a relatively large number of ways of ‘saying the same thing’, the problem is acute.

The solution is to presume that the production system is just as context-dependent as parsing: it uses what is provided in context at each step, so that structure or formula values (and even the actions used to construct trees) are taken from context wherever possible, and re-used. Any element in context that can be identified as adding appropriately to the tree may not require words to be uttered, as long as the effect of adding it as a tree update matches the subsumption condition. The effect is exactly as in the parallel parsing task, but, in production, the substitution step ensures that the words themselves do not need to be recovered and uttered – the context itself provides the update. It is this use of context which we argue pervades the phenomenon of overlapping actions, repetition of words, ellipsis, use of pronouns, all of which are characteristic of dialogue (Pickering & Garrod 2004) - and for good reason: all such choices enable search through the main lexical store to be totally by-passed (Purver et al. 2006).

To take the simplest kind of case, consider the mechanisms for producing an utterance of (3) in the context of having processed (6):

- (6) *Xerxes*            *iussit*    *milites*            *castra*            *captare*  
Xerxes=NOM   ordered   soldiers=ACC   camp=ACC   capture=INFIN  
“Xerxes ordered the soldiers to capture the camp.”
- (3) *Praemium*    *proposuit*  
reward=ACC   offered  
“He offered a reward.”

In uttering (3), the only difference from the earlier sequence of actions for the generation of (4) is the identification of the subject argument node provided by the verb’s actions. And it is here that using the very same process as in parsing reaps its rewards. Latin is pro-drop, so the subject node introduced by the verb is decorated with a metavariable licensing its identification from context. As long as the minimal context contains a suitable

term, matching the subsumption constraint, that term can be substituted as the value of the metavariable without more ado (see figure 9). Since the context is made up of the tree established by parsing (6), it will indeed contain the term  $Fo(Xerxes')$ . So this can be substituted for the variable  $Fo(\mathbf{U})$  in the tree under construction, duly updating that tree, exactly as in parsing except that in addition there has to be the process of checking that the appropriate subsumption relation is satisfied.<sup>17</sup>

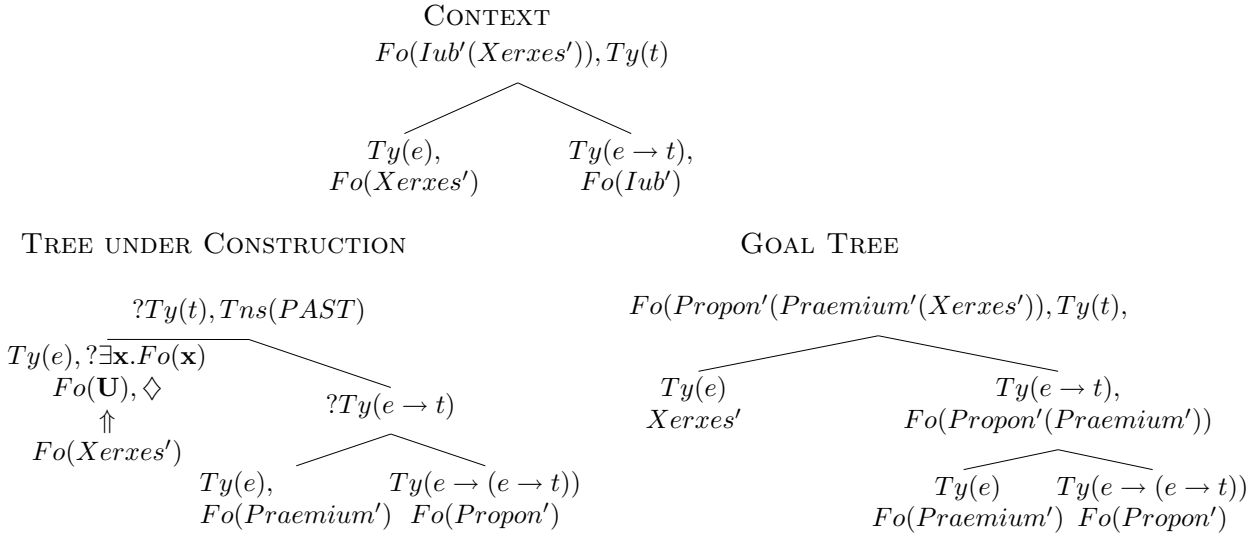


Figure 9: Parsing elliptical forms in context

The lack of any need to use words if the appropriate terms are already in the context applies equally to anaphoric expressions, as pronouns themselves by assumption project metavariables whose value can be provided from context, a clear saving if the formula recovered is itself complex. So the only addition to the production story on top of the ellipsis account is that anaphoric expressions must have special status in the lexicon as easy to retrieve in virtue of their function of enabling reuse of terms from context.

The significance of this use of context shouldn't go unnoticed. The whole point of using items from context, in both parsing and production, whether as triggered by the license of ellipsis, or by the presence of morphological pronouns, is to side-step the need to search in the main lexicon. If the context provides an update which itself will meet the restriction of subsuming the goal tree, then that update can freely be used without more ado. And with such an update, the tree can now be completed to yield the goal tree.

<sup>17</sup>We use the predicate *Iub'* as shorthand for the predicate parsed/constructed from the processing of *iussit milites castra captare*.

This minimization of cognitive costs in production extends beyond merely using elements in context wherever possible. It also applies to choice of words as well, even to choice of structure. Once a word or sequence of actions has been used in processing a string – parsing it or producing it - these actions can be re-used. In each case, the effect will be a sizeable reduction in the production task since the need to look in the general lexical store will simply have been side-stepped in favour of using what one has immediately to hand. Take (7), for example; and let us assume, that the initial pronoun decorates an unfixed node, and that the vocative *dea* decorates an independent tree linked to the initial structure via an appositional rule (see Cann et al. 2005), supplying the formula value of the pronoun.<sup>18</sup>

- (7) *te, dea, te fugiunt venti, te*  
 you=ACC goddess=VOC you=ACC flee winds=NOM, you=ACC  
*nubila coeli* [Lucretius.1.6 cited in Ramat (1990)]  
 clouds=NOM heaven=GEN  
 “You, goddess, you the winds flee, you the clouds of heaven flee.”

On this supposition, all that is required to explain the parallelism between the first and second sequence in (7) is to analyze the production of *te fugiunt venti* as re-using the very same strategy as used in either parsing or producing the first occurrence of *te*, that is, by assumption, building an unfixed node requiring a formula of type *e* which the second person pronoun is taken to decorate. Then the actions used to process the second sequence themselves provide the context for processing the third sequence – *te nubila coeli*. Here the speaker achieves a major source of economy. Just by repeating the word *te* the speaker can pick up on the actions in context, constructing an unfixed node and decorating it, then constructing the requisite predicate argument relation. Literally all that is required is the search for the words *nubila coeli* – the rest is provided by the context.

### 3 Pronoun placement: Latin and Medieval Spanish

This constraint of minimizing production costs applies not merely to lexical selection but also to the positioning of words once selected. In languages such as Latin, commonly, there is no need of a pronoun, as the verbs provide the license to use the context directly to identify their arguments. Nonetheless anaphoric expressions serve a purpose in the

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<sup>18</sup>This is not the only possible sequence of actions: each occurrence of *te* might, for example, be taken to decorate a structure to which the remainder is linked (see figure 6).

linearization task, as we have just seen with (7), as they enable argument terms to be identified independently of processing the verb. This consideration, in conjunction with the parallelism of parsing and production and general cognitive constraints such as relevance, helps to explain the positioning of pronouns. In relying on context, both speaker and hearer need the search for a substituent to be as small as possible (by general relevance considerations: Sperber & Wilson 1995). Accordingly, unless there is reason to the contrary, the position of an anaphoric expression will be as early as possible in the setting out of any propositional structure since this ensures that the search in the context for the value to be assigned to this expression will thereby be as small as possible. Indeed, in order to minimize the search space effectively, there is pressure not to introduce words expressing new information into the string before contextually determined ones. This is of course no more than a pragmatic, relevance-based explanation of the very wellknown given-before-new ordering that is regularly reported in free-constituent-order situations (see, for example, Vincent 1996).

In languages such as Latin, there is something more to be said. Latin is said to display a distinction between strong and weak pronouns, a distinction indicated by stress which is motivated primarily on the strength of the fact that clitic pronouns developed from the unstressed weak pronouns (Salvi 1996), and in these cases the pronoun canonically occurred in Latin in some poorly defined supposedly second position (though see Adams 1994), and NOT at the left periphery of any clausal sequence. Though this distinction is disputed by some (Rosanna Sornicola, personal communication), USES of pronouns indeed divide into those which do more than merely serve an anaphoric device, and those which do not. And those that do so may serve two further functions. Either they provide some initial term which constitutes a point of departure for what follows (as in (7)), or they provide a contrast, an update to what follows, in both such cases being set out initially in order to be identifiably separate from the structure to be constructed from what follows:<sup>19</sup>

- (8)    *“Tibi        ego        dem?”                    “Mihi        hercle uero”*                    [Plautus,  
          you=DAT I=NOM give=1ST.PS.SG me=DAT by Hercules, in truth  
          Pseudolus 626]

X. “Am I to give it to YOU?” Y. “Yes, by god, to ME.” (Adams’ translation).

Reconstructing these observations within the present framework, the so-called strong pronouns constitute a use in which the pronoun decorates a node at the edge of a propo-

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<sup>19</sup>The pronouns in (7) are identified by Ramat as free tonic pronouns “emphasized or referring to new referents” (Ramat 1990: 177); the pronouns in (8) by Adams are taken to be illustrative of an emphatic use “often marked by placement of the pronoun at the head of its clause” (Adams 1994: 104).

sitional boundary, i.e. a separate linked structure (7), or an unfixed node (8). In such cases, the pronouns serve a purpose over and above the anaphoric device of projecting a metavariable to which context provides a value, such as providing a shift in topic or a contrastive, hence focussed, item for update. Such devices have the added bonus of providing the means of identifying boundaries to propositional domains, either in the projection of a separate tree, a linked structure, or in identifying the initiation of some new propositional structure within which the term that they serve to introduce will provide an update.

Weak pronouns, by contrast, are involved in those uses of pronouns which serve only as anaphoric devices. Being by definition complementary to the use of pronouns for topic or contrastive purposes, this remainder of the set of pronouns will not be associated with those very structural devices which serve to identify some initiation of an emergent propositional structure. Nevertheless, like their ‘strong’ counterparts, the positioning of these pronouns under this use will be driven by relevance considerations. That is, once an emergent propositional structure is identified by some OTHER expression, we can expect weak pronouns to occur as closely following as possible.<sup>20</sup> With all pronouns, that is, the search within the context has to be minimized by placing the pronoun as close to the context within which its value is to be identified as is commensurate with its function in that context.

We now have everything in place to capture the effects of Wackernagel’s ‘law’. Both clitics and, by analysis, the weak pronouns of Latin occur as close to the left-edge of a clause as possible, but apparently not quite at the edge. Rather, they follow those devices which define an emergent propositional boundary. So it is that they immediately follow focussed elements, expressions containing a negative element, complementizers, relative pronouns, subordinate temporal adverbials, for what it is that these have in common is, by analysis, their association with some emergent edge of a new propositional domain:

- (9) *rogo ut mi mittas dalabram* [complementizer+pronoun]  
 I ask that me=DAT you send mattock  
 “I ask you to send to me a mattock.”

- (10) *et non eum uendedi* [negation+pronoun]  
 and not him=ACC I sold  
 “and I did not sell it/him.”

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<sup>20</sup>Following Relevance Theory assumptions (Sperber & Wilson 1995) we would expect that if there are any specific inferential effects to outweigh this minimization of contextual search, then this will provide justification for commensurate enlargement of the context to be searched. And this we would take to cover the lack of tightness of fit that Adams 2004 notes of weak pronoun positioning in Latin, even assuming that the effects are clause by clause (or ‘colon’ by ‘colon’ in his terminology).

- (11) *quae tibi nulla debetur* [relative-pronoun+pronoun]  
 which=NEUT,PL you=DAT no=NEUT,PL is owed  
 “nothing of which is owed to you.”
- (12) *Nihil me aliud consolatur*  
 nothing me=ACC other=NEUT,SG,NOM it consoles  
 “Nothing else gives me comfort.” [negative-quantifier+pronoun]
- (13) *Magno me metu liberaveris* [split part+pronoun]  
 great=NEUT,ABL me=ACC fear=ABL you will have freed  
 “You will have released me from great fear .”
- (14) *delectarunt me tuae litterae* [verb+pronoun]  
 delighted me your letter  
 “I was delighted with your letter.”

Subordinating complementizers, for example, transparently define the left-edge of a new propositional structure under construction, as in (9). So does negation, (10). In the case of so-called focussed elements (12), it is the particularities of the Dynamic Syntax framework which determine that these reflect initiation of a new propositional structure, since the rule introducing an unfixed node applies only if the type-*t*-requiring node has no other daughter node already introduced. The Dynamic Syntax account of relatives also leads us to expect that pronouns in Latin will immediately follow the relative pronoun (11), for precisely the same reason: the relative pronoun decorates an unfixed node with a copy of the head (see the pattern of construal in figure 5). This same style of analysis will apply without any modification to cases where the verb is initial (14). If nothing precedes it, the verb will be the sole but unmissable indication of a propositional structure, and it will duly be followed by a pronoun, securing the minimal distance from the context which its optimal use requires. Hence the Tobler-Mussafia effect.

The clitic pronouns of Medieval Spanish show much the same distribution:<sup>21</sup>

- (15) *Esto es el pan de Dios que vos da a comer* [rel-pro+pronoun]  
 this is the bread of God that CL he-gives to eat  
 “This is the bread of God that he gives you to eat.”  
 Granberg, 1988: 35
- (16) *E non los hi fallo* [negation+pronoun] “And he did not find  
 and not them there found=3SG  
 them there.” (XIII)
- (17) *Dixo la mugier: Quien te fizo rey?* [WH+pronoun]  
 said=3.SG the woman: who you made=3.SG king  
 “The woman said: Who made you king?” (XIII)

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<sup>21</sup>Data are taken from Bouzouita 2002: for details, see sources referenced there.



- (18) *e dizie que lo tenie del prior de Sancti Johannis*  
 and he-said that CL=DO he-had of-the prior of Saint Johan  
 [complementizer+pronoun]  
 “and he said that he got it from the prior of Saint John.” [XIII; Granberg 1988]
- (19) *e todo lo metieron a espada que.... and*  
 all CL=DO they-put to sword that...  
 [quantifier+pronoun]  
 “And he said that he got it from the prior of Saint John.” [XII Granberg 1988]
- (20) *Connocio -la Jacob* [verb+pronoun]  
 recognised-3SG her Jacob  
 “Jacob recognised her.” (XIII)

And so it is that we have the proclisis and enclisis effects in finite clauses for the weak pronouns of Latin and the clitic pronouns of medieval Spanish, described by a single generalization - not as an attraction to focus,<sup>22</sup> but as a minimising of context search, given the new introduction of an appropriate-sized domain. We can even explain the mixed effect displayed in Medieval Spanish in which the subject clitic may occur with either the clitic following the verb, or preceding it, with subtly different effects. As we saw in figure 7, subjects may be parsed as decorating an unfixed node, possibly immediately updated, hence since so identifying an emergent propositional structure, providing the necessary identificatory clues to warrant the generation of an immediately subsequent ‘weak’ pronoun. But they may also be taken to decorate the topnode of an independent linked tree, in which case, the subject expression will not itself be the indicator of the transition to another structure, hence there will have to be some OTHER expression intervening between the subject and the pronoun to provide this identificatory clue. And so it is that clitic preposing in Medieval Spanish in the presence of a subject expression tends to be identified with a focus, contrastive, interpretation and that when a clitic follows the verb in the presence of a subject, it is associated with background construal of the pronoun (see Bouzouita 2002 for detailed discussion).

- (21) *Maestre Fferran Garcia arcidiano de Niebla la mandó*  
 master Ferran Garcia archdeacon of Niebla CL-DO ordered=3.PS.SG  
*ffazer por mandado del jnffante. Yo Martin Perez la*  
 to-make for order of-the prince. I Martin Perez CL-DO  
*escriui* [contrastive-NP+pronoun ]  
 wrote=1.SG  
 “Master Ferran Garcia archdeacon of Niebla ordered to make on order of the  
 prince. I Martin Perez wrote it.” (Granberg 1988)

<sup>22</sup>This analysis of Adams 1994 fails to apply to relative pronouns, as he himself notes, and in any case there is no functional reason why pronouns should be attracted to a focus element, despite attempts to argue that this is pragmatically motivated. A focussing device generally presents some term in CONTRAST to what is to be taken as background, which is the antithesis of weak pronouns.

## 4 Alignment, Routinisation and Change

Of course, reflections on pragmatic pressures that induce linear ordering of words do not themselves provide an answer to why a language might have changed. Indeed, given that, by assumption, such relevance-induced pressures are ever-present, being language independent, one might expect that such pragmatically based determination of placement of weak uses of pronouns would be robust and long-lasting (Sornicola 1996). And indeed, as already noted, it was and is long-lasting, being pervasive through Latin (Adams 1994), lasting throughout medieval Spanish, and surviving even today in some dialects of Portuguese (Galician). The interpolation data such as (22) confirm the parallelism between medieval Spanish and Latin rather than with the modern Spanish, showing the possibility of expressions intervening between the clitic and the verb (data from Riviero 1986):

- (22) ... *quien te algo prometiere..*  
          who you something would-promise..  
          “the one who would promise something to you...” (Cor. 145)

With this potential for continuity across different time slices of a linguistic system, what has yet to be explained is why this production pressure should have got atrophied into a sequence of actions specific to the clitics. And now we can combine the details of the analysis presented for Latin with relevance-theoretic assumptions. As we have already seen, dialogue considerations show that in spontaneous dialogue, people use the same words, the same structures, the same senses to the words used, all of these parallel phenomena being modelled in DS terms as re-use of actions from context. But the effects go further than this, since, as shown by Garrod and Doherty (1994), hearers, having set up a parse sequence of actions in order to process what their speaker provides, may, over a very short time, set up routines for retrieval of a stored sequence of actions encompassing more than just one word; and clearly this is an independent means of saving on cognitive costs since it involves the retrieval from the lexicon of only one sequence of actions for a multiple string.

Production, storage, and language change can now be seen as going hand in hand. One form of the pronoun gets progressively phonologically reduced in virtue of predictability and recoverability from context while another form, in virtue of its use for other inferential effects, does not get reduced at all.<sup>23</sup> As a result of their increasing phonological dissimilarity, these two forms may come to be stored separately, the unstressed clitic

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<sup>23</sup>See Rosenbach and Jäger 2006 for a discussion of phonological reduction in connection with an independent argument for the role of priming (equivalently, alignment) in language change.

becoming defined to follow the set of triggers previously established through production constraints on order of words based on relevance considerations. This process constitutes a form of routinization, listing, as triggers, the environments with which such weak pronouns are construed as dependent on their immediate context, as noted above (9) - (14). The first observable step of encoding such a structurally heterogeneous set of triggers can only take the form of a disjunction, and this is clumsy, and hard to learn. So, once the clitic is stored separately as a discretely encoded form, such a disjunctive strategy for its construal is a natural candidate for yet further routinization effects. In all such cases, much the commonest expression to immediately follow the clitic(s) is the verb (noted by Adams 1994 amongst others); and a natural subsequent step of routinization, given the DS form of analysis, would be to call up the actions associated with the verb together with those associated with the clitic with a single lexical look-up mechanism albeit one that is ‘phrasal’ in form. Again, this constitutes an economy measure, further reducing processing effort. And so it is that routinization of clitic construal devices might come to constitute a re-bracketing – not so much an encliticization on the previous expression, but a procliticization on the subsequent verb. With such routinization, the restrictions on proclisis collapse, since the heterogeneous set of triggers defining the environment licensing construal of a clitic is not in principle a property that appropriately subclassifies the verbs with which the clitics are stored; and we get the intermediate stage of Renaissance Spanish, when all constraints on pre-verbal positioning of the clitics drop (see Bouzouita 2002, Bouzouita this volume, Bouzouita in preparation). And with this evidence of the routinization step of clitic-V sequencing taking place in Renaissance Spanish, we have indirect evidence that the placing of clitic pronouns must have ceased to be a purely relevance-driven strategy in Medieval Spanish – the merging of two discretely stored sequences of actions depends on there being two such stored sequences in place already.

With the splitting off of the weak pronouns from the inferentially more specialized ‘strong’ pronominal effects, we expect there to be a counterpart for the strong pronouns; and indeed the strong pronouns of medieval Spanish, as in modern Spanish, are subject to obligatory clitic doubling, a phenomenon generally taken to be a puzzle, since it appears to be a dual realization within an individual structure of a single thematic role (see Anderson 2005 for discussion):

- (23) *él perdonó-lo*  
 He, forgave=3.ps him [Med.Spanish]

“As for him, he forgave him,” (Riviero 1986)

- (24) *a ella le hablaban* [Mod.Spanish]  
 to her her=dat spoke=3.PL  
 “They spoke to her.”
- (25) *le hablaban a ella*  
 her=DAT spoke=3PL. to her  
 “They spoke to her.”

On this analysis, these data are entirely expected, for the pattern, already available in medieval Spanish is the effect of building a pair of linked structures, with the consequent obligatory explicit pronominal in the primary structure: it is merely the encoding of a routinization characteristic of the earlier strong pronoun use.

A lot more needs to be said of course. There is the attendant shift from object pro-drop in so far as Latin displayed this securely; and the subsequent divergent ways in which the Romance languages established discrete orderings in multiple clitic sequences.<sup>24</sup> But nevertheless, we hope there is sufficient evidence here to see a novel explanation of clitic ordering in the making. There is one particular reason why the specifics of the transition steps in the change process are so naturally characterizable in DS. ALL update actions, whether induced by a general computational action, or by a word- or morpheme- specific action, are defined in the very same vocabulary, that of updating the emergent semantic representation. Any shift from a generally available action to one that is associated with some idiomatic phrase or individual morpheme is no more than a shift in balance between generally available or lexically stored macros of actions: there is no formal shift whatever, merely the potential for progressive economizing on how many distinctly called-up sequences of actions the production process should involve.<sup>25</sup> Another immediate advantage of this account is that we expect all such changes to be gradual.

<sup>24</sup>Arguably this is due to the atrophying of case with the demise of case-marking morphology so rich in Latin, and this would lead to a situation in which case could no longer be used constructively. Consequently, the emergent languages would be faced with resolving a ban on more than one unfixed node at a time, with the distinctiveness of constructive case being retained only in the pronominal system and as a sequence of lexically triggered actions. The synchronic distribution of Romance clitic pronouns indeed reflect the process of unfixed-node building with case-triggered update in a number of ways: (i) developing a clitic form which is underspecified with respect to the two discrete object construals, the Spanish *leísmo* effect in which the dative *le* is used for both direct- and indirect-object construal, on the DS analysis decorating a locally unfixed node; or (ii) developing a fixed object relation directly as with French *le*, which is the conflation of building a locally unfixed node and then fixing its relation immediately; or (iii) developing a single composite clitic as with Spanish *se lo*, *se los*, and Italian *glielo*, reflecting the building of a paired sequence of argument NPs. See Bouzouita this volume for detailed specifications of single clitic placement in Medieval and Renaissance Spanish.

<sup>25</sup>This is unlike systems which analysis clitic placement in terms of a quite discrete form of morphological template (see Monachesi 2005, Anderson 2005), a perspective which would require the Latin-Romance shift to be seen as a perplexing categorial change.

More than one parsing strategy in pairing string with interpretation is available in the vast majority of cases. The presumption of there being non-identical paths to the recovery of some interpretation thus allows space for failure between speaker and hearer to match the sequence of actions the other participant has selected, without any communication breakdown.<sup>26</sup> But this means that over time, one procedure may atrophy without any individual noticing any diminution in expressiveness of their grammar system, or any discrepancy between their system and anyone else's.

## 5 The syntax-pragmatics interface

It may seem at this juncture that we have said nothing that isn't entirely obvious. However, the stance on which this account depends is precluded by almost all grammar formalisms, for the system of grammar as articulated is not encapsulated in any orthodox understanding of this term. First, in order to establish each predicate-argument substructure in an interpretive process, there has to be progressive build-up of structure and assignment of values from the progressively developing context to all underspecified elements. All such resolution is an essential part of the construction process: without it, compositionality of content assigned to an uttered string is not definable. So the feeding of pragmatically determined values into the structure-building process is an intrinsic design feature.

Second, there is the nature of the pragmatic construal itself. We take the process to involve the construction of representations following a broadly Fodorian methodology, constructing representations in the language of thought (see Fodor 1983 and elsewhere).<sup>27</sup> So the general discourse configurations and the cognitive constraints that determine them may be no less structured than representations internal to any individual natural-language grammar, contrary to assumptions sometimes favoured by those adopting a functionalist perspective (see Traugott 1998 for discussion). Furthermore, given the proposed account of alignment in dialogue, there is no essential entertaining of the other participant's mental state in language use, either in the assignment of structure as interpretation to the string, or in selection of words to express some structure as content of a thought; and this account is novel. All decisions, according to this DS account, are made relative

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<sup>26</sup>See Bouzouita this volume for an argument that this mismatch plays a role in triggering this shift.

<sup>27</sup>The language of thought is taken to differ from natural languages in not being a parsing system, and so is not associated with a mapping from one system onto another, a process that is definitive of a natural language.

just to the immediate context as established by having processed the previous structure (whether as parser or as producer); and this context provides a detailed record not only of the information processed, but HOW it was processed. This reliance on context for establishing as many aspects of interpretation as possible is essential to the production task if it is to remain do-able at all. It is not, or doesn't have to be, a matter of altruistically considering the hearer's task: it is simply that without such heavy reliance on what has just been processed, the incremental lexicon-search task would be daunting indeed. These assumptions are in conflict with Gricean assumptions about the nature of the communication process, for example as held by recent advocates such as Bach and Clark (Bach 1994, Clark 1996), for whom higher-order reasoning about speaker/hearer intentions is essential to communication. The assumptions made also fail to coincide with relevance-theoretic assumptions (Sperber & Wilson 1995), though in this case the divergence is less striking.<sup>28</sup> In Relevance Theory, the interpretation of a string requires a concept of sentence-meaning encoded within the grammar formalism, and recovering an interpretation of an uttered string involves building some interpretation which the speaker could have intended (Sperber & Wilson 1995). In the DS account to the contrary, the account of interpretation and of production involves parsing the words item by item, and re-using constructs made available in one's own cognitive context to progressively establish some propositional formula with which to reason. This task may be successfully performed without any evaluation by either speaker or hearer as to the mutual manifestness of elements of that context, for they are made direct from the individual's own context as part of the building of the structure expressed by the string as uttered in that context. Substitution of values for anaphoric expressions and for ellipsis are part of the construction process itself BEFORE any such high-level constructs are entertained.<sup>29</sup> So there is on this view a pervasive interaction between structural processing and general cognitive principles which is quite unlike the encapsulation view in which sentences are parsed first with some assignment of sentence-meaning before any pragmatic processing takes place (Sperber & Wilson 1995, Carston 2002). It follows from this that there is no intervening level of logical form which constitutes the output of the grammar as a sentence-meaning, which could serve as the source of input to high-level reasoning about what is mutually manifest and thereby reach some conclusion about what could have been intended.

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<sup>28</sup>In this connection, see Sperber's characterisation of 'the naive optimist's' mode of interpretation (Sperber 1994).

<sup>29</sup>Nothing prevents representations of other participants' attitudes being constructed if required; but nothing necessitates their construction either.

There is also an articulation of the feeding relation between production and parsing, an aspect of the model which is not matched by any other formalism. On this view, the pressures of production are so tightly coordinated with steps of parsing that they are no more than the implementation of the principles for action determined by the grammar formalism itself. The consequence is that any shift in the response to such production pressures leads to change in the underlying system of processing, and that itself constitutes a change in the grammar formalism, despite its parsing orientation. So, appropriately, language change is seen as driven by speakers (Joseph 1990 amongst others). And syntactic change no longer has to be seen as occurring only in the shift from one generation to another. Children in early acquisition stages make very high use of alignment, with the notable use of copying (Tomasello 2003), a clear manipulation of immediate context that enables production to follow closely upon parsing, well before a secure body of lexical specifications is in place. On this view, there is little reason to see young children as uniquely the source of syntactic innovation (contra Lightfoot and others: see Lightfoot 1998). Nor does syntactic change have to be seen as the result of peer pressure of one dominant group over another. Syntactic change may, after all, simply be a change induced by the every-day way in which we use and store the tokens of our language.

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